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GRAPHIC AND WINDOW OPERATING METHOD AND RECORDING MEDIUM

(Zukei oyobi Uindo Sosa Hoho oyobi Kiroku Baitai)

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SPECIFICATION

(54) Title of the Invention

GRAPHIC AND WINDOW OPERATING METHOD AND RECORDING MEDIUM/2

[Claims]

[Claim 1] A graphic operating method, which is used in a graphic processing system having a central processing unit, a display unit with a screen and a pointing device for moving a cursor on said screen by operation of a user, and is characterized by having an examining means for examining the overlapped state of graphics from multiple graphic informations and image informations;

a display means for displaying a graphic displayed in a position selected by said cursor, a marker that 1 to 1 correspond to graphics overlapping above/below this graphic and a leader line connecting the marker and the graphic corresponding to the marker on same screen as the graphic; and a selecting means for making the graphic corresponding to a selected marker into a selected state by selecting the displayed marker without changing graphics overlapping each other.

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[1]Numbers in the margin indicate pagination in the foreign text.

[Claim 2] The graphic operating method described in Claim 1, which is characterized by having a graphic operating means for moving a graphic corresponding to a marker without changing the graphics overlapping each other by operating said displayed marker with a cursor on said screen.

[Claim 3] The graphic operating method described in Claim 2, which is characterized by having a display means for displaying the shape and pattern of said displayed marker with colors, shape of a graphic corresponding to a marker, shape showing features, attribute information of the graphic or a reduced objective graphic.

[Claim 4] The graphic operating method described in Claim 2 or Claim 3, which is characterized by having a display means for displaying a graphic operating marker at the periphery of said displayed marker and a graphic operating means capable of indirectly changing the attributes held by a graphic corresponding to the marker without changing the graphics overlapping each other by operating the graphic operating marker displayed at the periphery of said displayed marker with the cursor on said screen.

[Claim 5] A window operating method, which is characterized by applying the graphic operating method described in any of Claims 1 to 4 to various window systems.

[Claim 6] A recording medium, which is characterized by storing a software for realizing the graphic operating method described in any of Claims 1 to 4.

[Claim 7] A recording medium, which is characterized by storing a software for realizing a window operating method applying the graphic operating method described in any of Claims 1 to 4 to various window systems.

[Detailed Description of the Invention]

[0001]

[Technical Field of the Invention] The present invention relates to a graphic processing system, such as CAD, etc., capable of displaying multiple graphics on a display means and operating each graphic individually or multiple graphics in a lump, etc., and relates to a window system capable of displaying multiple graphics on a display means and performing different operating processings for each window.

[0002]

[Prior Art] When graphics and images are generically defined as 「graphics」 and when multiple graphics are displayed by a conventional graphic processing system, a part or all of other graphics are hidden according to the display positions and sizes of graphics because the overlapping of graphics each other is allowed. Thus, when multiple graphics exist, a user cannot directly

select an objective graphic totally hidden by other graphics to operate the graphic. In order to select a graphic totally hidden by other graphics, such a procedure wherein graphics covering an objective graphic to be selected are moved so as not to cover the graphic once selected, then the objective graphic is selected and operated, after the operation is completed, the graphics moved to operate the objective graphic are selected and moved to the original position again must be taken. When the same actions are taken in the conventional window system, the overlapping order of windows is changed, an operating window is displayed and moved to the uppermost, and then the overlapping order of windows must be changed again. To solve the above problem, graphic indication operation supporting systems described in Japan Kokai 05-334415, etc. and window systems described in Japan Kokai 08-76960, etc. are given.

[0003] A system wherein graphic elements existing in a display area on a screen assigned by a user are displayed in order and then the user selects and indicates a desirable graphic by a confirmation operation has been disclosed in Japan Kokai 05-334415. A system wherein the display and overlapped state of windows, window graphs in a state of viewing the windows from the horizontal longitudinal direction and the horizontal transverse direction are displayed in an area different from the window

display area, and actual windows can be operated by operating the window graphs has been disclosed in Japan Kokai 08-76960.

[0004]

[Problem to Be Solved by the Invention] However, in the systems disclosed by the above inventions, systems such as Japan Kokai 05-334415, etc. have such a problem that when a desirable graphic cannot be indicated in selecting or indicating graphics or a selected graphic is wrong, the operability reduces because the above operations must be repeated several times. Systems of Japan Kokai 08-76960, etc. have such a problem that a window display area reduces on a display unit which needs to provide an area for indicating window graphs and has a limited area.

[0005] Moreover, it has such a problem that when the position and size of windows are changed to separate and display the length and breadth in the horizontal direction, the operability is lowered because the length and breadth must be operated separately. Furthermore, it has such a problem that when display windows increase, a user cannot easily recognize the correspond-ence of a window and a display on a window graph corresponding to the window because the display window and the window graph are displayed at separated positions.

[0006] The purpose of the present invention consists in providing a graphic operating method which facilitates the selection of one arbitrary graphic or one window from /3

multiple graphics or windows displayed by overlapping them on the screen of a display unit and can facilitate the movement of said selected graphics or windows or operations such as size change, etc. in a graphic processing system or a window system.

[0007]

[Means for Solving the Problem] To achieve the above purpose, the present invention enables an easy selection without changing the order of graphics overlapping each other by selecting a graphic displayed in a position selected by a user with a means such as a pointing device, etc., a marker that 1 to 1 correspond to multiple graphics overlapping above/below this graphic, displaying a leader line connecting the marker and the graphic corresponding to the marker on the same screen as the graphic by other graphics by making the graphic corresponding to the selected marker into a selected state even if the graphic is a graphic totally hidden by other graphics. At this time, the marker corresponding to the graphic is displayed on the same screen as the graphic, therefore a limited display area on the display unit are usable to the maximum for the graphic display.

[0008] By operating a displayed marker, a graphic corresponding to the marker is moved not only in the longitudinal direction or transverse direction, and an operation of moving it in a two-dimensional plane direction such as a slant, etc. is also

enabled by one operation without changing the order of graphics overlapping each other.

[0009] The recognition of a graphic shown by a displayed marker in conformity with a leader line connecting the marker and the graphic can be facilitated by displaying the shape, pattern of said marker with colors, shape of the graphic corresponding to the marker, shape showing features, attribute information of the graphic or a reduced objective graphic. However, the recognition of said graphic showing the marker can also be facilitated by using either the shape, pattern of marker or the leader line only.

[0010] By displaying a graphic operation marker at the periphery of a displayed marker and operating the graphic operation marker displayed by a user with a means such as pointing device, etc., the size of graphic corresponding to the marker can be indirectly changed not only in a longitudinal or transverse one-dimensional direction but also in a two-dimensional direction (slant direction) without changing the order of graphics overlapping each other.

[0011] The above means also has the same effect on windows by applying it to window systems.

[0012] Actual examples of the present invention are illustrated in detail based on drawings.

[0013] Fig. 1 is a block diagram showing a schematic constitution of a graphic processing system in Actual Example 1 of

the present invention. The diagram comprises an input unit **110** inputting various informations, such as a pointing device, a graphic processing unit **120** performing operations for a desirable graphic in accordance with the input made by said input unit **110**, a graphic control unit **130** equipped with an overlap detection unit **140** detecting graphics overlapping with a predetermined graphic and controlling the graphics in accordance with operations made by said graphic processing unit **120**, a marker operating unit **150** performing operations for a desirable graphic in accordance with the input made by said input unit **110**, a marker control unit **160** preparing markers for graphics detected by the overlap detection unit **140** and controlling the marker in accordance with the input made by said marker operating unit **150**, and a display unit **170** displaying the graphics of said graphic control unit **130** and the markers of said marker control unit **160**. The present invention is also realizable in a window system by changing the graphic operating unit **120** into a window operating unit and the graphic control unit **130** into a window control unit.

[0014] This actual example shows a case wherein a PC is used as system, a mouse or a keyboard is used as input unit **110**, a display is used as display unit, the graphic operating unit **120**, graphic control unit **130**, overlap detection unit **140**, marker operating unit **150** and marker control unit **160** are realized by a software executed in a memory and a CPU.

[0015] Fig. 2 displays four graphics **210**, **211**, **212** and **213** by overlapping the graphics on the display unit **170**. The overlapping order of graphics is the graphic **210** at the uppermost and the graphic **213** in the lowermost. For simplifying the illustration, the graphic **210**, graphic **211**, graphic **212** and graphic **213** are taken as rectangles smeared on their inner side. Although the graphic **212** is depicted with dotted lines and hatching for con-venience so that it can be seen in Fig. 2, generally, the graphic **212** completely hidden under the graphic **211** is not displayed at all.

[0016] A procedure wherein the graphic **212** is moved so that it can be seen outside the graphic **211** in the state of Fig. 2 is shown according to a processing flow of Fig. 3.

[0017] A graphic of cursor position is detected by indicating a position at which the graphic **212** exists in Fig. 2 as the first step of the processing. The cursor position is taken as coordinates (80, 110) in this actual example. First, the cursor indication position is substituted into coordinate variables (XC, YC) (310), and a graphic displayed at the position of coordinate variables (XC, YC) is detected (400). Details of the graphic detection processing procedure are shown in Fig. 4. Fig. 5 in which the coordinates of graphics are sorted so as to make the overlapping order of graphics from top to bottom is used to detect the graphic of indicated position. A counter variable I shows the

overlapping order of Fig. 5. First, a judgment is started from the uppermost graphic in the overlapping order (420), and the judgment is repeated till a constant Num indicating the total number of graphics (430). In this actual example, the constant Num is 4 because the total number of graphics is 4.

[0018] If the graphic **210** of overlapping order I = 1 is displayed at the indicated position (XC, YC) or not is judged (440),/ XC : X1 → 80 < 110, therefore no graphic **210** /4 exists at the cursor position. Accordingly, the counter variable I is increased by 1 (450) to judge the next graphic. If the graphic **211** of overlapping order I = 2 is judged like graphic **210**, the cursor position exists on the inner side of Fig. 211. The uppermost graphic in the cursor position may be detected, therefore the repetition processing for judgment is interrupted, and the detection processing is ended with the graphic **211** of overlapping order I = 2 as detection result (460). If a graphic displayed at the cursor position does not exist according to the judgment, when the repetition is ended, the detection processing is ended as no detected graphic (470).

[0019] When a graphic is detected by a graphic detection result of cursor position, graphics overlapped with the graphic of cursor position are detected as the second stage. When a graphic is not detected, the processing is ended without doing anything (510). When a graphic is not detected by the system, if a graphic

has been selected, a processing for releasing the selection of graphics sometimes is performed.

[0020] A detailed procedure of detection processing of graphics overlapping with the indicated graphic is shown in Fig. 6. A coordinate list of all graphics except for the indicated graphic is utilized for detection of graphics overlapping with the indicated graphic. A list of graphics except for the indicated graphic **211** is shown in Fig. 7. Fig. 7 has flags showing the overlap with the indicated graphic **211**, and all of the graphics are initiated by OFF for preparing the list. The counter variable I of Fig. 6 shows the column number of Fig. 7. First, a judgment is started from the row 1 (610), and the judgment processing is repeated (Num -1) (number of graphics) times (620).

[0021] Display coordiantes (10, 10) - (150, 150) of the indicated graphic **211** and coordinates of graphics of first column in the list are compared, and whether the graphics overlap each other or not is judged (630). Because all graphics are limited to smeared rectangles in this actual example, the overlapping of graphics each other can be judged by comparison of simple coordinates. As a result of judgment, the graphic **210** in the Ith column of Fig. 7 overlaps with the indicated graphic **211**, therefore a flag showing the overlap is turned ON (660), the counter variable I is increased by 1 to examine the next graphic (650).

[0022] If the graphics do not overlap, the flag is turned OFF (640). Processings of 620 to 650 are repeated, if the counter variable I becomes (Num -1 > 3), the judgment processing is ended.

[0023] As a result of the above processing, Fig. 7 becomes Fig. 8. From Fig. 8, it is known that images overlapping with the indicated graphic **211** are the graphic **210** and graphic **212**.

[0024] Markers for the indicated graphic **211** and the graphic **210** and graphic **212** overlapping with the indicated graphic **211** are displayed as the third stage (700), and the indicated graphic **211** is made into a selected state (710). Consequently, as shown in Fig. 9, a leader line **231** and a marker **241** for indicated graphic **211**, a leader line **201** and a marker **202** (by Fig. 9, but **230** and **241** in original text) for graphic **210** and a leader line **232** and a marker **242** for graphic **212**.

[0025] Moreover, in this actual example, a graphic selection frame **250** enclosing the indicated graphic **211** is displayed for showing the selected state of indicated graphic **211**, except for the indicated graphic **211**, the leader lines and the markers for the graphic **210** and graphic **212** are taken as dotted lines. In this actual example, the markers are so displayed as to overlap with the indicated graphic, but the operability of markers is considered to further improve it by controlling the display positions so as not to overlap with the indicated graphic.

[0026] The graphic **212** is selected and moved as the final stage. If the marker **242** for graphic **212** is selected in the state of Fig. 9, the graphic in the selected state shifts from graphic **211** to graphic **212** and becomes an image display shown in Fig. 10. In Fig. 10, as is known from the shape of graphic **212** in the selected state, the graphic **212** is displayed semi-transparently, and a dotted line enclosing the graphic **212** and showing the selected state is displayed on the outer side of graphic **212**. If a user moves the marker for graphic **212** in the selected state by mouse dragging operation, the graphic **212** is also moved simultaneously in a quantity equal to the movement quantity of marker and in a direction equal to the movement direction of marker (800). In the movement of marker **242** by the mouse dragging operation, the graphic **212** is also moved by following the movement of marker **242**, and the operability can be improved by clearly knowing the position after the movement. The movement of marker started by the mouse dragging is ended by releasing the mouse button.

[0027] As a result of the marker operation, the graphic **212** is moved so that it can be seen on the outer side of graphic **211** as shown in Fig. 11.

[0028] Consequently, the graphic **212** completely hidden under the graphic **211** can be moved without moving the graphic **211** by the above processing procedure. Thus, a direct movement of a graphic

hidden by other graphics is enabled by using the present invention without moving graphics covering the graphic. Moreover, the objective graphic can also be operated without changing the order of graphics overlapping each other.

[0029] Although all the graphics are taken as smeared rectangles for simplifying the illustration in this actual example, the graphics actually have complicated shapes such as polygon, circle, etc. and sometimes are graphics of non-smeared frames only. In this case, more complicated judgment algorithm sometimes becomes necessary because a need to discriminate the shape of displayed graphics and existence of smearing for judgment of cursor indicated graphic and judgment of graphics overlapping with the indicated graphic.

[0030] Fig. 12 is taken as Actual Example 2 of the present invention, and it shows a display example on a display unit in case of displaying a reduced graphic corresponding to a marker. In Fig. 12, the shape and colors of a graphic **912** corresponding to a marker **942** are displayed by the marker **942**. It becomes easy to recognize the correspondence of markers by displaying shape of graphics, reduced images, colors, features of graphics, and those showing attributes of graphics even if graphics displaying markers become multiple.

[0031] Fig. 13 is taken as Actual Example 3 of the present invention, and it shows a display example on a display unit /5

in case of displaying a graphic operating marker **980** at the periphery of a marker **974**. The size of a graphic **970** corresponding to the marker **974** is also changed in interlock with actions of the graphic operating marker by operating the graphic operating marker **980** similarly as the procedure of moving graphics in Actual Example 1 by operations such as mouse dragging, etc. It enables to directly change the size of graphic without moving covered graphics even if the graphic is completely hidden by other graphics. In the case of size change, like the graphic movement, the size change can be made while confirming the size and shape of graphic **912** after change by changing the size of graphic **912** following the operation onto the graphic operating marker, therefore the operability is further improved.

[0032] In a window system, it also becomes possible to directly perform such operations as selection, movement, size change, etc. of a window totally hidden by other windows without moving covering windows. In a window system, when a window different from a graphic processing system is selected, it becomes possible to easily display a window totally hidden by other windows at the uppermost of overlapping by performing a change processing of the overlapping order in which the selected window is displayed at the uppermost of overlapping.

[0033] Moreover, in both the graphic processing system and the window system, it becomes possible to operate multiple

graphics or windows in a lump by displaying not necessarily one graphic or one marker in a window, displaying and operating one marker every group for multiple graphics or windows grouped according to operations of user or attributes of graphics or windows.

[0034]

[Effects of the Invention] The present invention is constituted as described above and therefore has such effects that it can facilitate the selection of arbitrary one graphic or one window from multiple graphics or windows displayed by overlapping them on a screen of display unit and facilitate operations of movement, size change, etc. of selected graphics or windows.

[Brief Description of the Drawings]

[Fig. 1] Block diagram showing the schematic constitution of a graphic processing system relating to actual examples of the present invention.

[Fig. 2] Plan view showing a displayed state on a graphic processing system before embodying Actual Example 1 of the present invention.

[Fig. 3] Flow chart processing the movement of graphics being Actual Example 1 of the present invention.

[Fig. 4] Flow chart showing the processing of a graphic detection subroutine of cursor indication position of Fig. 3.

[Fig. 5] Chart arraying coordinates of graphics displayed on the graphic processing system in Actual Example 1 of the present invention overlapping order of graphics.

[Fig. 6] Flow chart showing the processing of a graphic detection subroutine of graphics overlapping in the cursor indicated graphic in the processing flow of Fig. 3.

[Fig. 7] Chart having coordinates and flags of graphics, except for a cursor indicated graphic, overlapping with cursor indicated graphic in Actual Example 1 of the present invention.

[Fig. 8] Chart showing contents of Fig. 7 changed by an overlapping detection subroutine of Fig. 6 in Actual Example 1 of the present invention.

[Fig. 9] Plan view showing a displayed state on a display unit after graphic indication with a cursor in Actual Example 1 of the present invention.

[Fig. 10] Plan view showing a displayed state on a display unit when a marker for movement objective graphic **212** is selected from the state of Fig. 9 in Actual Example 1 of the present invention.

[Fig. 11] Plan view showing a displayed state on a display unit after the marker for movement objective graphic **212** is moved from the state of Fig. 10 in Actual Example 1 of the present invention.

[Fig. 12] Plan view showing a displayed state on a display unit after graphic indication with a cursor in Actual Example 2 of the present invention.

[Fig. 13] Plan view showing a displayed state on a display unit after graphic indication with a cursor in Actual Example 3 of the present invention.

[Description of the Symbols]

110) input unit

120) graphic operating unit

130) graphic control unit

140) overlapping detection unit

150) marker operating unit

160) marker control unit

170) display unit

241) marker

942) marker displayed with reduced graphic

980) graphic operating marker

[Fig. 5]

Fig. 5

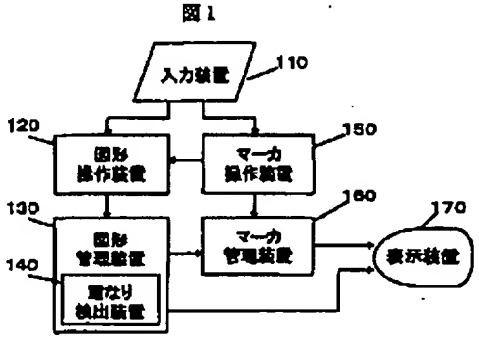
Overlapping Order	Graphic	X1	Y1	X2	Y2
1	210	110	110	180	180
2	211	10	10	150	150
3	212	50	60	130	140
4	213	5	170	50	190

[Fig. 7]

Fig. 7

No.	Graphic	X1	Y1	X2	Y2	Overlapping
1	210	110	110	180	180	OFF
2	212	50	60	130	140	OFF
3	213	5	170	50	190	OFF

[Fig. 1]



110) input unit

120) graphic operating unit

130) graphic control unit

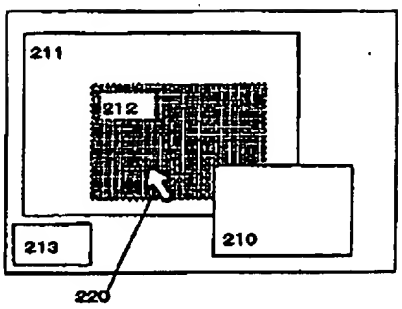
140) overlapping detection unit

150) marker operating unit

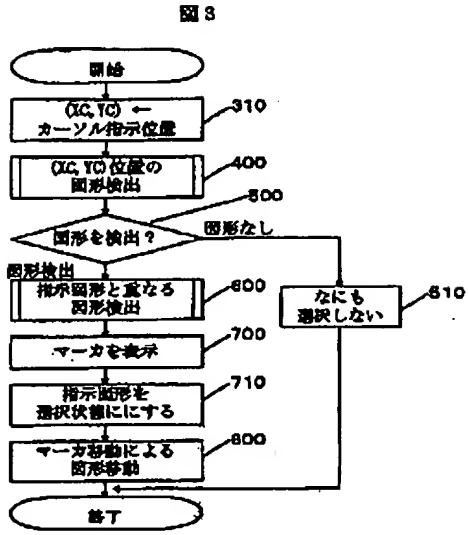
160) marker control unit

170) display unit

[Fig. 2]



[Fig. 3]



Start

↓

310 (XC,YC) ← cursor indication position

↓

400 Detect graphic of (XC,YC) position

↓

500 Is graphic detected? No graphic

↓ ↓

510 Select nothing

Graphic detected

600 Detect graphics overlapping with indicated graphic

↓

700 Display marker

↓

710 Make indicated graphic into selected state

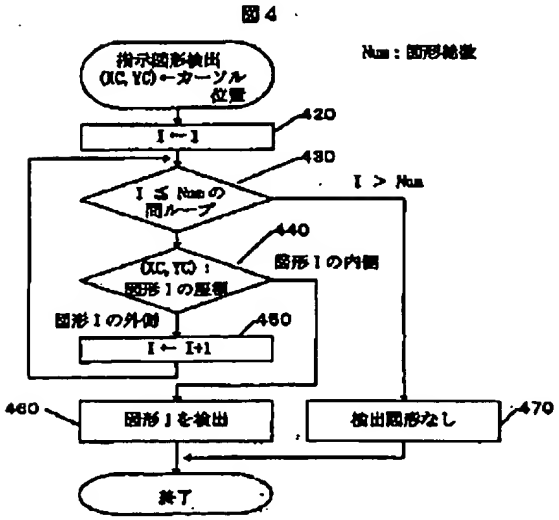
↓

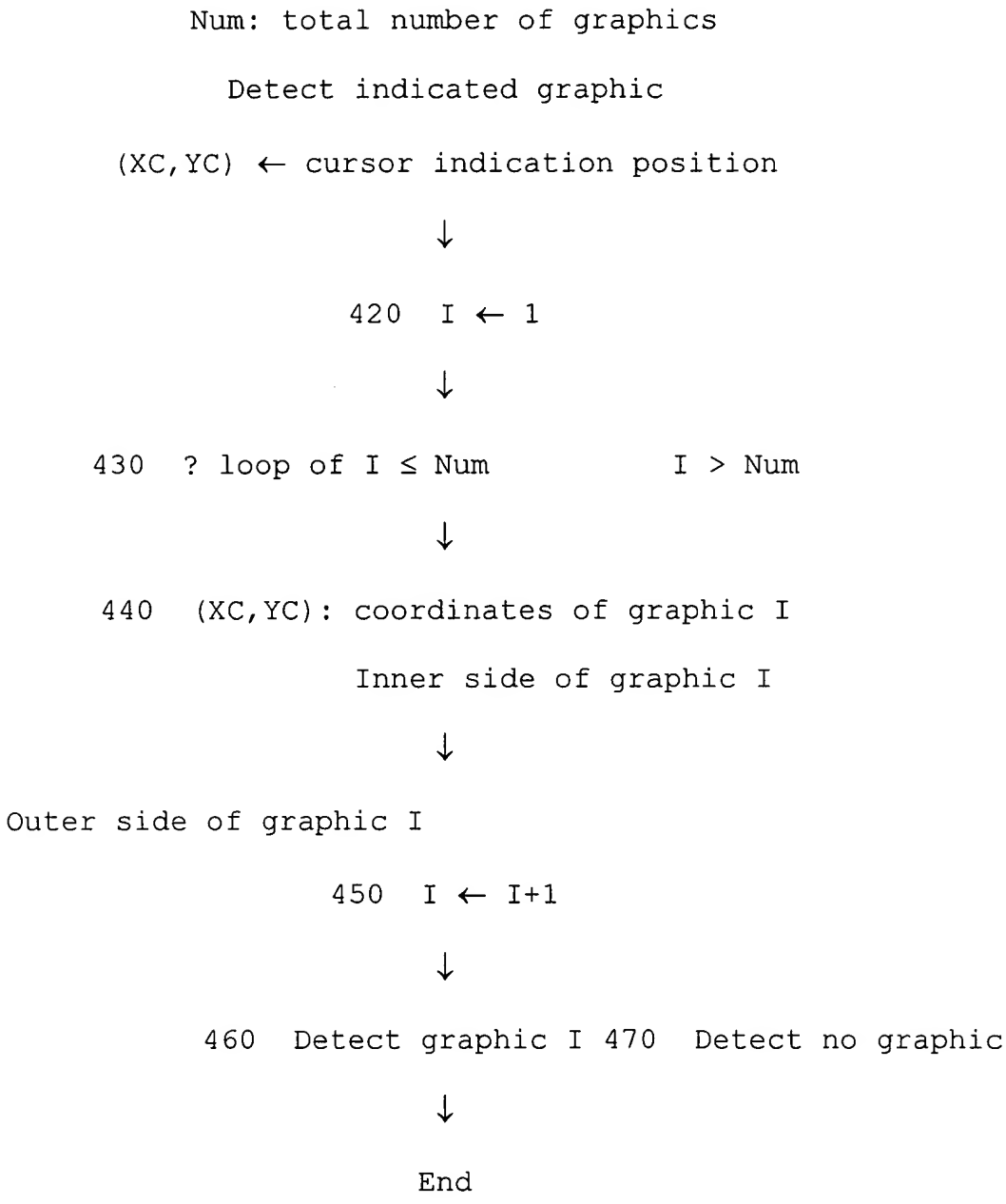
800 Move graphic by marker movement

↓

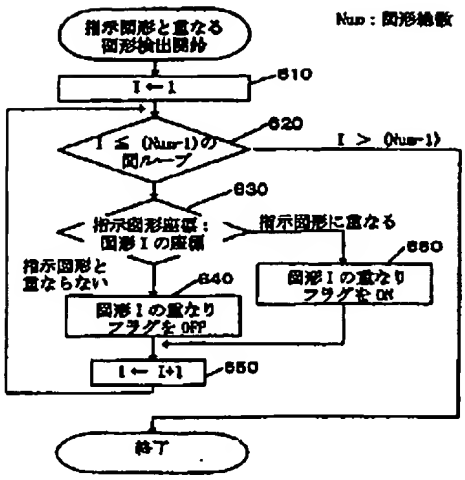
End

[Fig. 4]




Num: total number of graphics
Detect indicated graphic
(XC,YC) ← cursor indication position
420 I ← 1
430 ? loop of I ≤ Num
I > Num
440 (XC,YC): coordinates of graphic I
Inner side of graphic I
Outer side of graphic I
450 I ← I+1
460 Detect graphic I
470 Detect no graphic
End

[Fig. 6]



Num: total number of graphics

610 I ← 1

↓

620 ? loop of I ≤ (Num -1) I > (Num - 1)

↓

Coordinates of indicated graphic:

Coordinates of graphic I

Overlapping with indicated graphic

Not overlapping with indicated graphic

↓

660 Turn on overlapping

flag of graphic I

↓

640 Turn off overlapping flag of graphic I

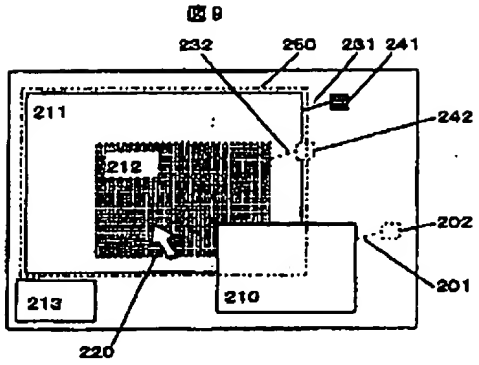
↓

650 I ← I + 1

↓

End

[Fig. 9]

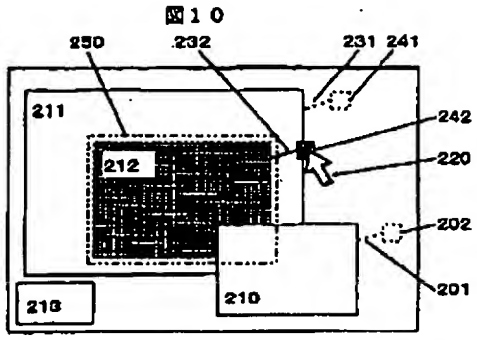


[Fig. 8]

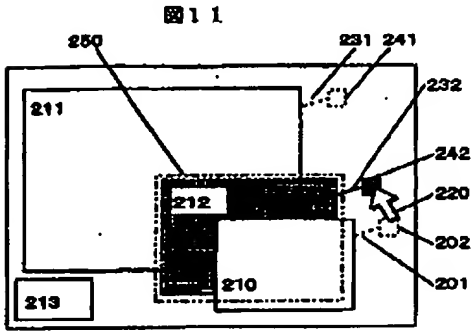
番号	図形	X1	Y1	X2	Y2	重なり
1	210	110	110	180	180	ON
2	212	50	60	130	140	ON
3	213	5	170	50	190	OFF

No.	Graphic	X1	Y1	X2	Y2	Overlapping
1	210	110	110	180	180	ON
2	212	50	60	130	140	ON
3	213	5	170	50	190	OFF

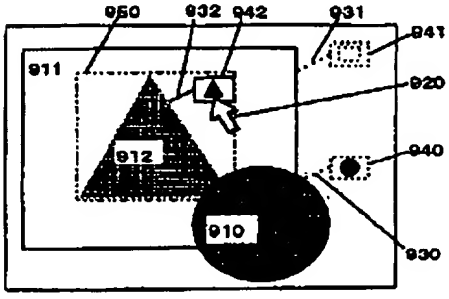
[Fig. 10]



[Fig. 11]



[Fig. 12]



[Fig. 13]

図13